AMENDMENTS TO THE SPECIFICATION

✓Please replace paragraph [0009] on page 4 with the following amended paragraph:

-- [0009] The use of HPDSC as described herein provides a measure of stability through oxidative induction times. A polyol ester can be blended with a constant amount of dioctyl diphenylamine which is an antioxidant. This fixed amount of antioxidant provides a constant level of protection for the polyol ester base stock against bulk oxidation. Thus, oils tested in this manner with longer induction times have greater resistance to oxidation. For the high hydroxyl esters of the present invention in which no antioxidant has been added, the longer induction times reflect the greater stability of the polyol ester high hydroxyl molecules by and also the natural intrinsic antioxidancy of the esters due to the unesterified -CH_2OH groups.~~,~~ --

✓Please replace paragraph [0010] on page 4 with the following amended paragraph:

-- [0010] The present inventors have developed a unique polyol ester composition having enhanced thermal/oxidative stability when compared to conventional synthetic polyol ester compositions. This was accomplished by synthesizing a polyol ester composition from a polyol and branched and/or linear carboxylic or aromatic acid in such a way that it has a substantial amount of unconverted -CH_2OH groups.~~-~~ Having a highly branched polyol ester backbone enhances the ability of the high hydroxyl ester to act similarly to an antioxidant, i.e., cause the thermal/oxidative stability of the novel polyol ester composition to drastically increase, as measured by high pressure differential scanning calorimetry (HPDSC). This selectively branched polyol ester composition restricts the mechanisms by which the non-CH_2OH portion of the high hydroxyl ester oxidizes and thereby provides an intramolecular mechanism which is capable of scavenging alkoxide and alkyl peroxide radicals, thereby substantially reducing the rate at which oxidative degradation can occur. --

Please replace paragraph [0015] on page 6 with the following amended paragraph:

✓-- [0015] The antioxidant of the present invention is preferably a unique polyol ester having unconverted hydroxyl groups from the reaction product of a polyol with a branched and/or linear carboxylic or aromatic acid, thereby allowing the unconverted -CH$_2$OH groups to form the hydroperoxyl moiety (HOO•) upon oxidation. This antioxidant comprises a primary aliphatic hydroxyl group linked to an organic backbone such that upon oxidation a hydroperoxyl moiety capable of boosting the efficacy of free radical scavengers and hydroperoxide decomposer type antioxidants is generated in situ. --

✓Please replace paragraph [0016] on page 6 with the following amended paragraph:

-- [0016] Antioxidants that are covered by the present invention include the general class of polyol esters, phenols, aromatic amines, phosphites, and sulfur containing antioxidants, as well as any conventional antioxidants that function as free radical inhibitors or hydroperoxide decomposers,~~;~~ provided that these antioxidants contain an unconverted -CH$_2$OH group which is capable of forming a hydroperoxyl radical or moiety (HOO•). Depending upon the structure of the acid used, the resultant ester product can function as ~~is~~ either an antioxidant or an antioxidant booster. --

✓Please replace paragraph [0027] on page 10 with the following amended paragraph:

-- [0027] High hydroxyl number esters (i.e., hydroxyl numbers between ~~about~~ greater than about 30 to about180)~~,~~ are preferably derived from selected carboxylic acids, such as 3,5,5-trimethylhexanoic acid or 2-ethylhexanoic acid and combinations thereof, and have the capability of scavenging radicals, such as alkylperoxyl radicals and alkylhydroperoxyl radicals. In a preferred embodiment, the hydroxyl number of the high hydroxyl ester ranges from greater than about 40 to about 120, and most preferably greater than about 50 to about 100. As such, when such high hydroxyl esters are subjected to oxidation conditions using HPDSC experiments as shown hereafter, they tend to resist oxidation because they have intrinsic antioxidancy. --

✓Please replace paragraph [0037] on page 14 with the following amended paragraph:

✓-- [0037] The above mechanism shows how the oxidative degradation of the free $-CH_2OH$ ↓ moiety results in the production of a reactive intermediate (i.e., HOO•), which scavenges alkoxyl and alkylperoxyl radicals. The product of the scavenging reactions are more stable intermediates and molecular oxygen. The key to the success of this chemistry is that the remaining portion of the compounds are relatively non-reactive in an oxidative environment. The present invention includes the use of aromatic antioxidants such as phenols and aromatic amines together with molecules containing a $-CH_2OH$ moiety to produce an antioxidant complex that is relatively non-reactive in oxidative environments, except for the free radical scavenging reactions associated with AH or the reaction of $-CH_2OH$ to produce HOO•. Antioxidants that are covered by this embodiment include the general class of phenols, aromatic amines, phosphites, and sulfur containing antioxidants, as well as any conventional antioxidant that functions as a free radical inhibitor or hydroperoxide decomposer. --

✓Please replace paragraph [0039] on page 15 with the following amended paragraph:

-- [0039] Alternatively, the antioxidant system could be produced such that there are not any free hydroxyl groups nor any chemical bonds that would produce the $-CH_2OH$ moiety upon hydrolysis, but which could produce, , upon oxidation, the $-CH_2OH$ moieties to yield HOO•. a The antioxidants of the present invention that do not contain any free hydroxyl groups nor any chemical bonds that would produce the $-CH_2OH$ moiety upon hydrolysis, but which do produce the $-CH_2OH$ group upon oxidation, can be derived from the reaction product of: --

✓Please replace paragraph [0040] on page 16 with the following amended paragraph:

-- [0040] The polyol ester composition of the present invention is preferably formed by reacting a polyhydroxyl compound with at least one acid (e.g., a branched and/or linear mono-carboxylic acid, diacid, or an aromatic acid). In the polyol ester composition, the polyol is preferably present in an excess of about 10 to 35 equivalent percent or more for the amount of acid used. The composition of the feed polyol is adjusted so as to provide the desired composition of the product ester. --

✓Please replace paragraph [0046] on page 18 with the following amended paragraph:

-- [0046] wherein R is any aliphatic or cyclo-aliphatic hydrocarbyl group (preferably an alkyl) and n is at least 2. The hydrocarbyl group may contain from about 2 to about 20 or more carbon atoms, and the hydrocarbyl group may also contain substituents such as chlorine, nitrogen and/or oxygen atoms. The polyhydroxyl compounds generally may contain one or more oxyalkylene groups and, thus, the polyhydroxyl compounds include compounds such as polyetherpolyols. The number of carbon atoms (i.e., carbon number, wherein the term carbon number is ~~as~~ used throughout this application) refers to the total number of carbon atoms N_T in either the acid or alcohol, as the case may be. ~~)~~ --

✓Please replace paragraph [0048] on page 19 with the following amended paragraph:

-- [0048] Acids that are used in the preparation of high hydroxyl number esters affect ~~effect~~ their intrinsic antioxidancy. As noted, high hydroxyl number esters produce a relatively high concentration of HOO• , which is produced during oxidation of the -CH_2OH group. Because the -CH_2OH group is only one part of the high hydroxyl number ester, the rate at which the other part (i.e., the non-CH_2OH ~~The non-CH2OH~~ portion of the ester) oxidizes is important. Selected branched acids produce a slow rate of oxidation of this non-CH_2OH portion. When this portion oxidizes, the products include alkylperoxyl radical (ROO•), which are deleterious to performance. The key to success is an AH in which the rate of non-CH_2OH oxidation is slow relative to the rate of the -CH_2OH oxidation. The following groups of acids are preferred~~. A~~ acids that impart or produce a relatively higher concentration of HOO• available to scavenge a higher number of alkyl radicals, ROO•~~, are preferred~~. Accordingly, acids are C_2-C_{20} acids, branched or linear. Preferred acids are selected from the following groups and are described in terms of the total number of carbon atoms (N_T) and the number of carbon atoms in the longest contiguous chain (N_C). N_C is usually less than or equal to N_T, as N_T includes carbons in methyl branches. --

Please replace paragraph [0049] on page 19 with the following amended paragraph:

-- [0049] Carboxylic acid isomers having a carbon number N_C ranging from 2 to 4, including straight chain acids, and branched acids such that the acid branches are derived from methyl or ethyl groups. --

Please replace paragraph [0050] on page 20 with the following amended paragraph:

-- [0050] Carboxylic acid isomer having a carbon number N_C ranging from 5 to 20 and:

i. acids in which the penultimate carbon (i.e., C_{m-1}, where m is 20 and represents the maximum length of the longest contiguous carbon chain N_C ~~C_{n-1}~~) has 2 methyl branches

ii. acids in which the penultimate carbon has one methyl group

iii. acids in which the penultimate carbon is a methylene moiety. --

Please replace paragraph [0051] on page 20 with the following amended paragraph:

-- [0051] For acids characterized in (i) above, it is preferred that:

a. when branches are all gem dimethyl branches, these branches are at any position between C_2 and C_{m-1}~~$_{n-1}$~~;

b. branches are monomethyl when there are gem dimethyl branches or a carbonyl group located two carbon positions from the point of attachment for the monomethyl group; and~~.~~

c. a monoethyl branch exists at position C_2. --

Please replace paragraph [0054] on page 21 with the following amended paragraph:

-- [0054] The branched acid is preferably, but not necessarily, a mono-carboxylic acid which has a carbon number in the range between about C_5 to C_{13}, more preferably about C_7 to C_{10} wherein methyl or ethyl branches are preferred as noted above. The mono-carboxylic acid is preferably at least one acid selected from the group consisting of: 2,2-dimethyl propionic acid (neopentanoic acid), neoheptanoic acid, neooctanoic acid, neononanoic acid, iso-hexanoic acid, neodecanoic acid, 2-ethyl hexanoic acid (2EH), 3,5,5-

trimethyl hexanoic acid (TMH). One especially preferred branched acid is 3,5,5-trimethyl hexanoic acid. The term "neo" as used herein refers to a trialkyl acetic acid, i.e., an acid which is triply substituted at the alpha carbon with alkyl groups. These alkyl groups are equal to or greater than CH_3 as shown in the general structure set forth herebelow: --

✓Please replace paragraph [0061] on page 23 with the following amended paragraph:

-- [0061] The high hydroxyl polyol esters discussed above may be grafted to any other material to provide oxidation stability thereto. Such other materials may include mineral oils, polyol ester base stocks, polyalpha olefin base stocks, fuels,~~.~~ oligomers and polymers. --

✓Please replace paragraph [0077] on page 29 with the following amended paragraph:

-- [0077] Metal-containing or ash-forming detergents function both as detergents to reduce or remove deposits and as acid neutralizers or rust inhibitors, thereby reducing wear and corrosion and extending engine life. Detergents generally comprise a polar head with long hydrophobic tail, with the polar head comprising a metal salt of an acid organic compound. The salts may contain a substantially stoichiometric amount of the metal in which they are usually described as normal or neutral salts, and would typically have a total base number (TBN), as may be measured by ASTM D-2896, of from 0 to 80. It is possible to include large amounts of a metal base by reacting an excess of a metal compound such as an oxide or hydroxide with an acid gas ~~such a~~ such as carbon dioxide. The resulting overbased detergent comprises neutralized detergent as the outer layer of a metal base (e.g., carbonate) micelle. Such overbased detergents may have a TBN of 150 or greater, and typically from 250 to 450 or more. --

✓Please replace paragraph [0108] bridging pages 39-40 with the following amended paragraph:

-- [0108] As illustrated in figure 1, as the hydroxyl number increases (i.e., a fully esterified ester), the oxidative induction time increases, thereafter, less rapidly reduces. It is believed that as the hydroxyl number increases beyond substantially esterified (i.e., OH number #greater than about ~~aboout~~ 30) a higher concentration of hydroperoxyl radicals HOO• is formed and may function to scavenge a relatively greater number of alkyl radicals ROO• that are produced in the oxidation process. However, above a preferable range (i.e., OH number # greater than about 180) the hydroperoxyl radicals, HOO•, become oxidative initiators as well as alkyl radical scavengers, and oxidative stability declines. --

√Please replace paragraph [0110] on page 42 with the following amended paragraph:

-- [0110] Certain polyol esters containing at least 1 mole % unconverted hydroxyl groups show dramatic enhancements in thermal/oxidative performance in the HPDSC test. These esters contain specific types of branching and the enhancement is seen for both trimethylol propane (TMP) and pentaerythritol (both mono grade and technical grade) esters. Table 2 4 below summarizes the results obtained by the present inventors. --

√Please replace paragraph [0111] on page 43 with the following amended paragraph:

-- [0111] The results set forth above in Table 2 4 and Fig. 1 demonstrate that when all of the initially added antioxidant (Vanlube®-81) is consumed, that the ester radicals are not healed and uncontrolled decomposition occurs at lower times as shown in sample numbers 1, 4 and 6 which have small amounts of unconverted hydroxyl groups, i.e., hydroxyl number less than about 30, as well in the polyol esters formed from linear acids regardless of amount of unconverted -CH_2OH l groups present (see samples numbers 11-15). With certain branched esters such as sample numbers 2, 3, and 6-10 above, the unconverted -CH_2OH group (i.e., the only molecular change from the full ester) is capable of producing HOO•, which transfers its hydrogen to the RO• and ROO• radicals so as to create more stable intermediates , thereby acting as an additional antioxidant. With the linear acid esters set forth in the above sample numbers 11-15, the rate of oxidation of the alkyl chain occurs faster than the rate of •OOH production and consequently the high hydroxyl ester does not inhibit oxidation. --

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Please replace paragraph [0113] bridging pages 44-45 with the following amended paragraph:

-- [0113] The results in Table 3 above demonstrate that polyol esters with elevated levels of unconverted hydroxyl groups (i.e., sample numbers 1 and 2) result in enhanced ~~greatly enhance the~~ oxidative induction times ~~of the lubricant formulation~~ versus conventional polyol esters which do not have any significant amount of free or unconverted hydroxyl groups. Moreover, combining these unique polyol esters with an antioxidant such as V-81 significantly extends the time required for decomposition (see sample no. 1). Although the time for decomposition was reduced when this polyol ester did not include any added antioxidant, it still took approximately 3½ times longer to decompose versus a conventional C_9 acid polyol ester which had an antioxidant additive (i.e., 58.3 minutes (sample 2) versus 16.9 minutes (sample 3)). Furthermore, Samples 4 and 5 demonstrate that decomposition of the polyol ester compositions having a hydroxyl number less than 5 occurs much more rapidly compared to polyol ester compositions of the same acid and polyol having a hydroxyl number greater than 50 (e.g., Samples 1 and 2) regardless of whether or not an antioxidant is admixed with the respective polyol ester composition. This clearly demonstrates that synthesizing a polyol ester composition having unconverted hydroxyl groups disposed about the carbon chain of the polyol ester provides enhanced thermal/oxidative stability to the resultant product, as measured by HPDSC. Finally, a comparison of Sample Nos. 2 and 5, wherein no antioxidant was used, clearly establishes the antioxidant properties of the polyol ester of technical grade pentaerythritol and 3,5,5-trimethyl hexanoic acid having substantial amounts of unconverted hydroxyl group bonded which has an HPDSC of 58.3 minutes versus the same polyol ester with little or no unconverted hydroxyl groups which has an HPDSC of 3.14 minutes. --